

**GODDARD SPACE FLIGHT CENTER**

## Test Lab Report Summary

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<i>Report Number:</i>	Q10167DPA	<i>Project:</i>	SWIFT
<i>Part Type:</i>	Microcircuit	<i>System:</i>	BAT
<i>Part Number:</i>	OP293ES	<i>Initiated Date:</i>	05/01/2001
<i>Date Code:</i>	0021	<i>Report Date:</i>	07/10/2001
<i>Manufacturer:</i>	Analog Devices	<i>Investigator:</i>	C. Greenwell (562)
<i>Generic Number:</i>	OP293	<i>Requester:</i>	B. Meinhold (562)
<i>Purchase Spec:</i>	Commercial	<i>Approval / Date:</i>	

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## Step 1: INCOMING INSPECTION

<u>Test</u>	<u>Quantity</u>	<u>Passed</u>	<u>Failed</u>
External Visual	N/A	N/A	N/A
PIND Condition A	N/A	N/A	N/A

## Step 2: DESTRUCTIVE PHYSICAL ANALYSIS

Destructive Physical Analysis (DPA) was conducted per GSFC document "Plastic Encapsulated Microcircuit (PEM) Guidelines for Screening and Qualification for Space Applications", except that cross-section was done without dye penetrant and glassivation integrity testing was not performed.

No rejectable defects or anomalies were observed during this analysis.

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Part No: OP293ES  
 Date Code: 0021

## Summary of Analysis:

	<i>Serial Number</i>	<u>G05</u>	<u>G07</u>	<u>H01</u>	<u>H05</u>	<u>H07</u>
<i>External Examination</i>						
1. Markings - legibility and correctness _____		A	A	A	A	A
2. Integrity of package seals _____		N/A	N/A	N/A	N/A	N/A
3. Condition of external leads and plating _____		A	A	A	A	A
4. Overall package condition _____		A	A	A	A	A
<i>Radiographic Examination</i>						
5. Die bonding material and die alignment _____		A	A	A	A	A
6. Package seal integrity _____		N/A	N/A	N/A	N/A	N/A
7. Presence of foreign material _____		A	A	A	A	A
8. Lead dress (if revealed) _____		A	A	A	A	A
<i>Acoustic Microscopy Inspection</i>						
9. Condition of material interfaces (delaminations) _____		A	A	A	A	A
10. Condition of molding material (voids, cracks) _____		A	A	A	A	A
<i>Internal Examination (including cross-section)</i>						
11. Presence of foreign material _____		A	A	A	A	A
12. Mechanical condition of die _____		A	A	A	A	A
13. Wire bonds and lead dress _____		N/P	N/P	A	A	A
14. Die bonding material _____		A	A	A	A	A
15. Condition of die surface _____		N/P	N/P	A	A	A
16. Condition of metallization _____		N/P	N/P	A	A	A
17. SEM Examination _____		N/P	N/P	A	A	A
<i>Bond Strength</i>						
18. Strength _____		N/P	N/P	A	A	A
19. Metallization adherence _____		N/P	N/P	A	A	A
<i>Die Bond Strength</i>						
20. Strength _____		N/P	N/P	N/P	N/P	N/P

SN's G05 and G07 subjected to cross-sectional examination.

(\* = Refer to comments, A = acceptable, U = unacceptable, N/A = not applicable, N/P = not performed)

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## Appended Photographs:

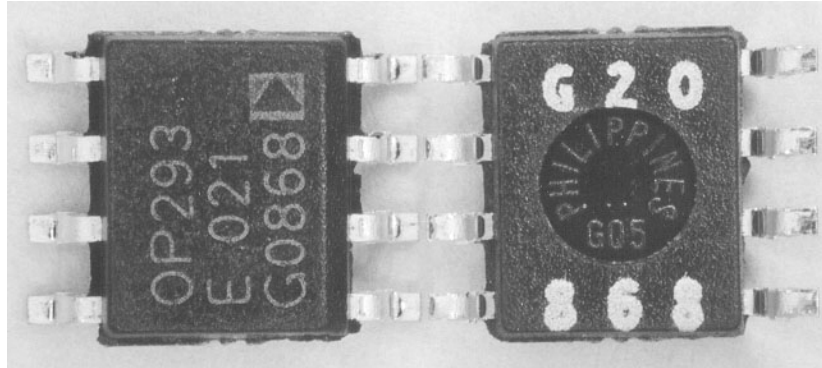


Figure 1. External top and bottom views of the OP293ES devices. Each device had a unique two or three character alphanumeric code that was used for reference designations during this analysis. 6X

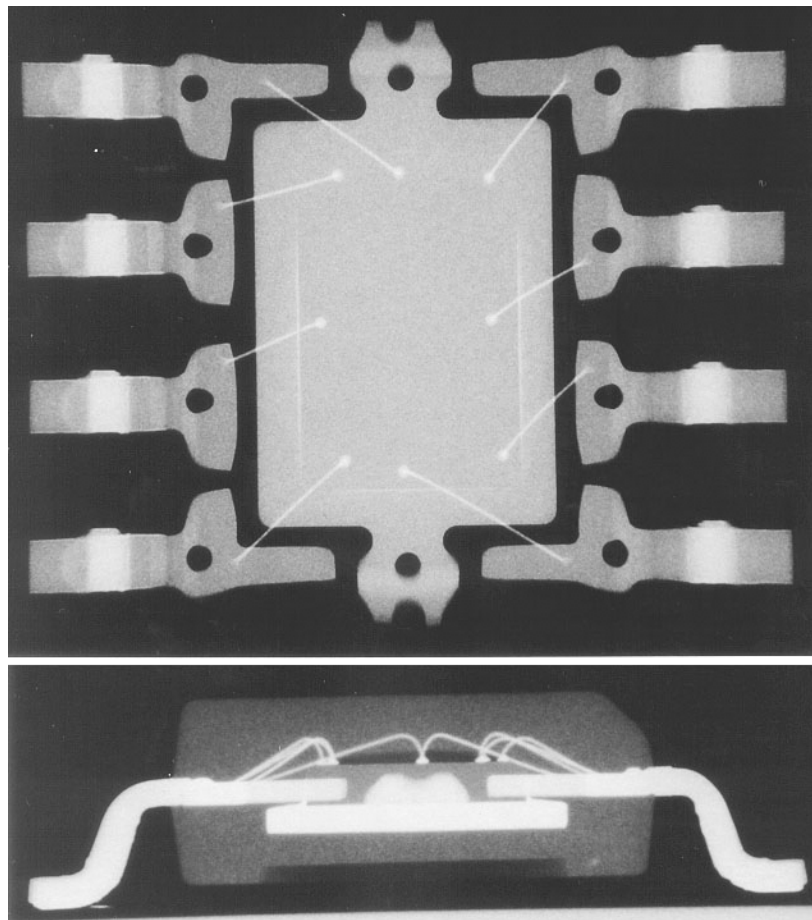


Figure 2. Top and side view radiographic images. Note the die coat visible in the side view image (dark area over the die). 16X

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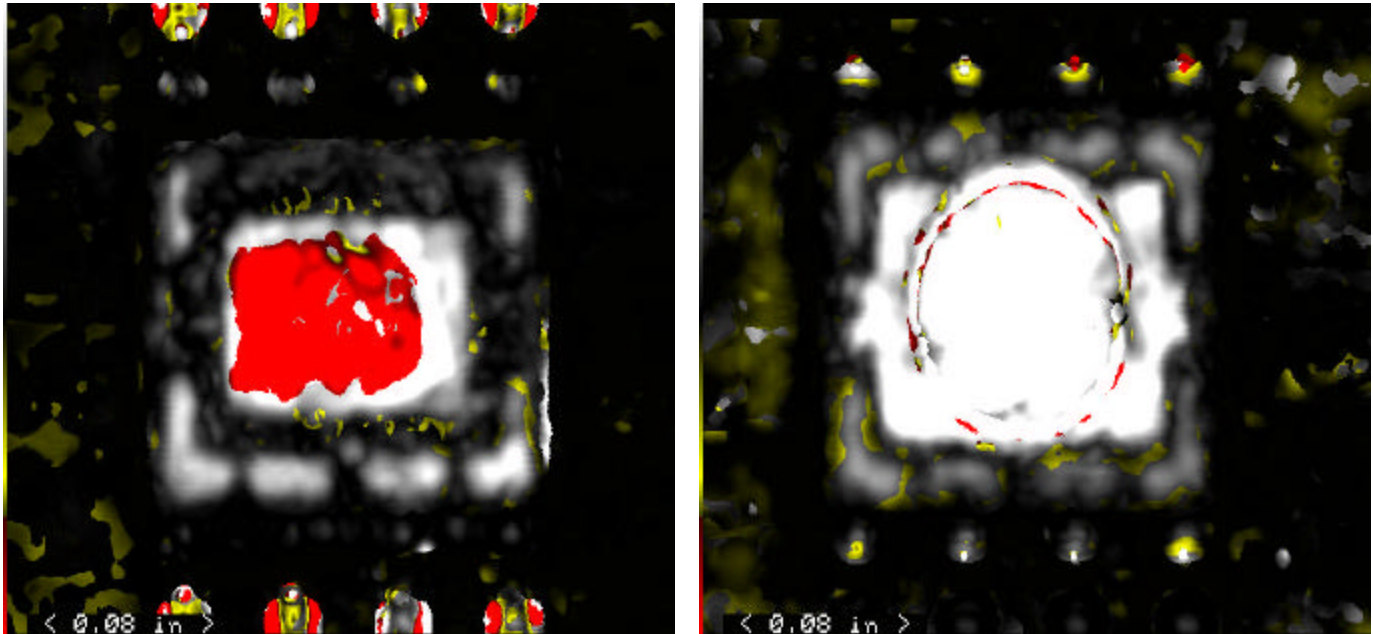


Figure 3. Top (left) and bottom C-SAM images of SN G05. The red area in the topside view is produced by the glob-top coating on the die.

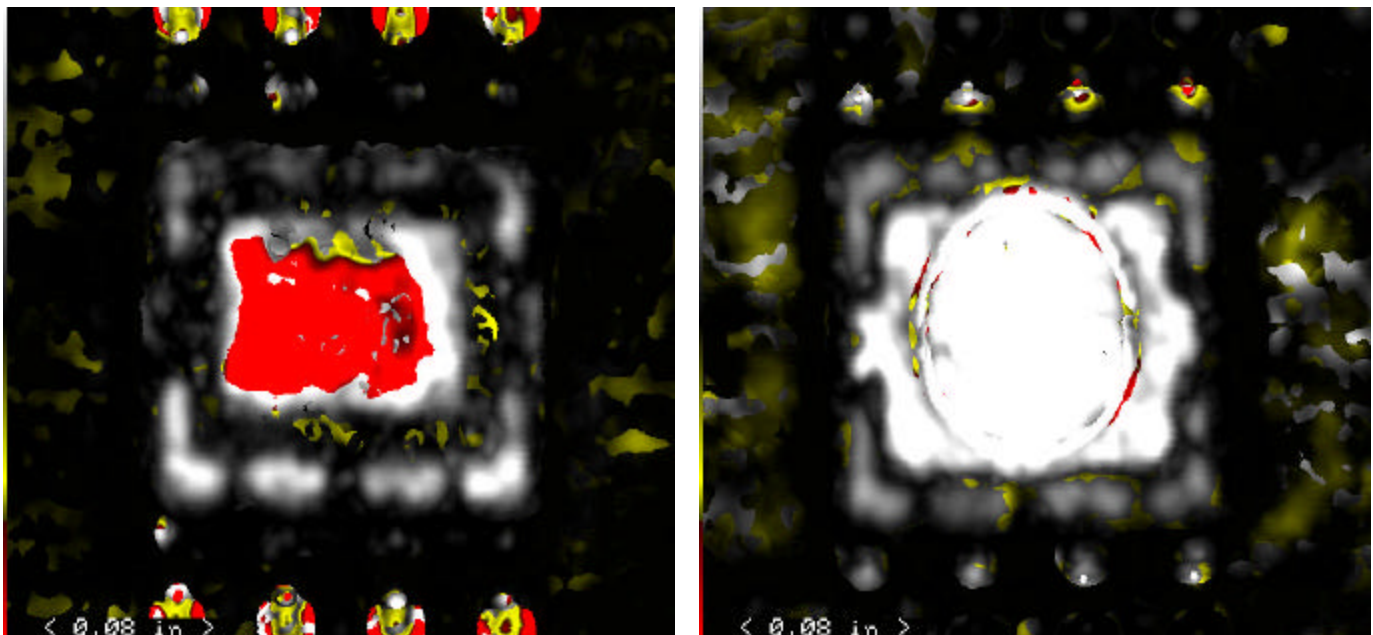


Figure 4. Top (left) and bottom C-SAM images of SN G07.

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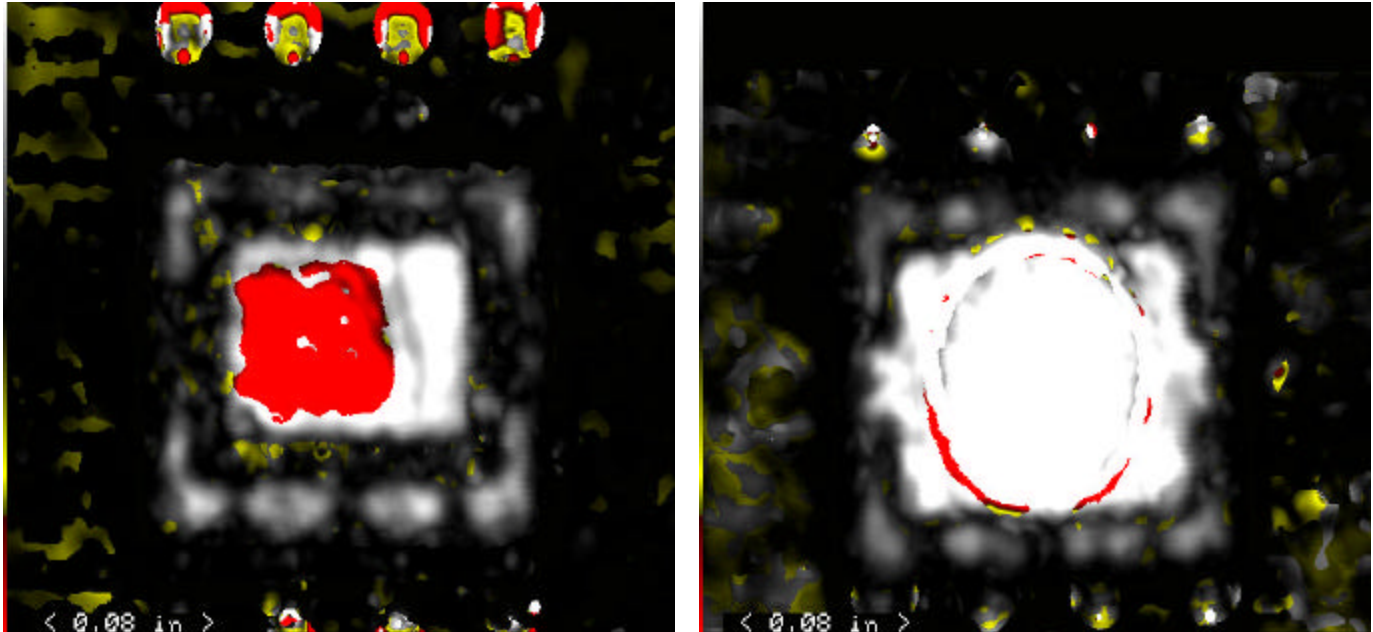


Figure 5. Top (left) and bottom C-SAM images of SN H01.

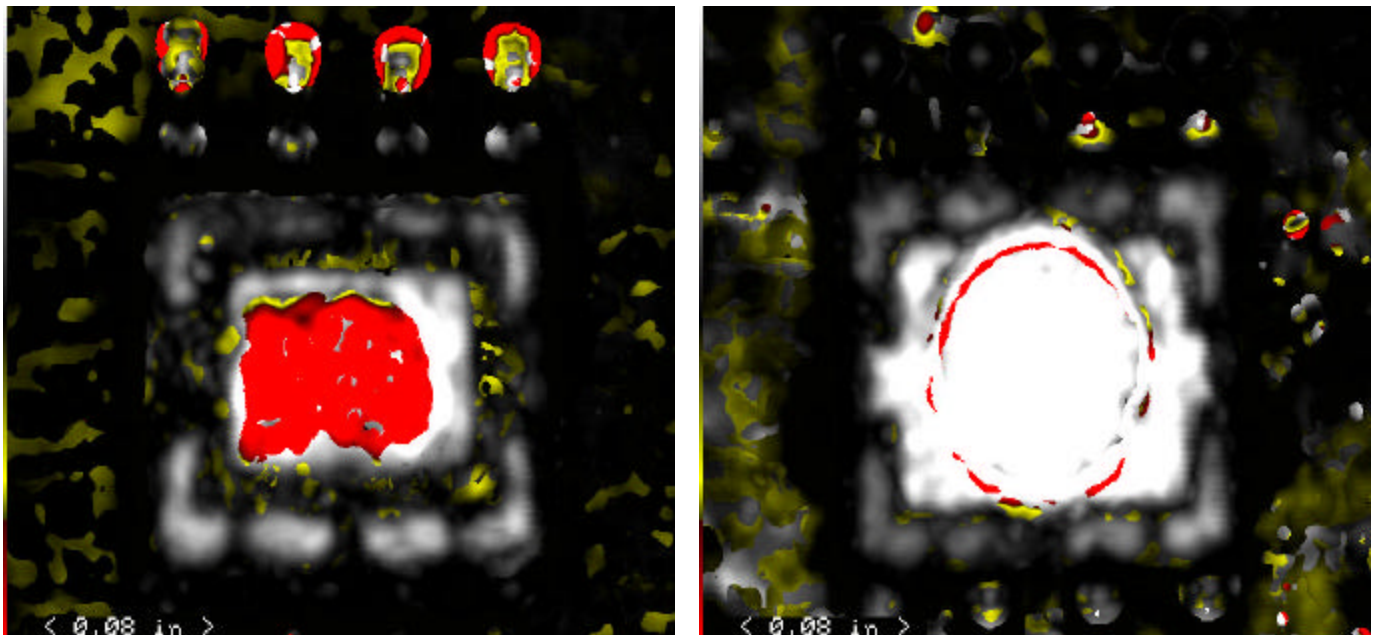


Figure 6. Top (left) and bottom C-SAM images of SN H05.



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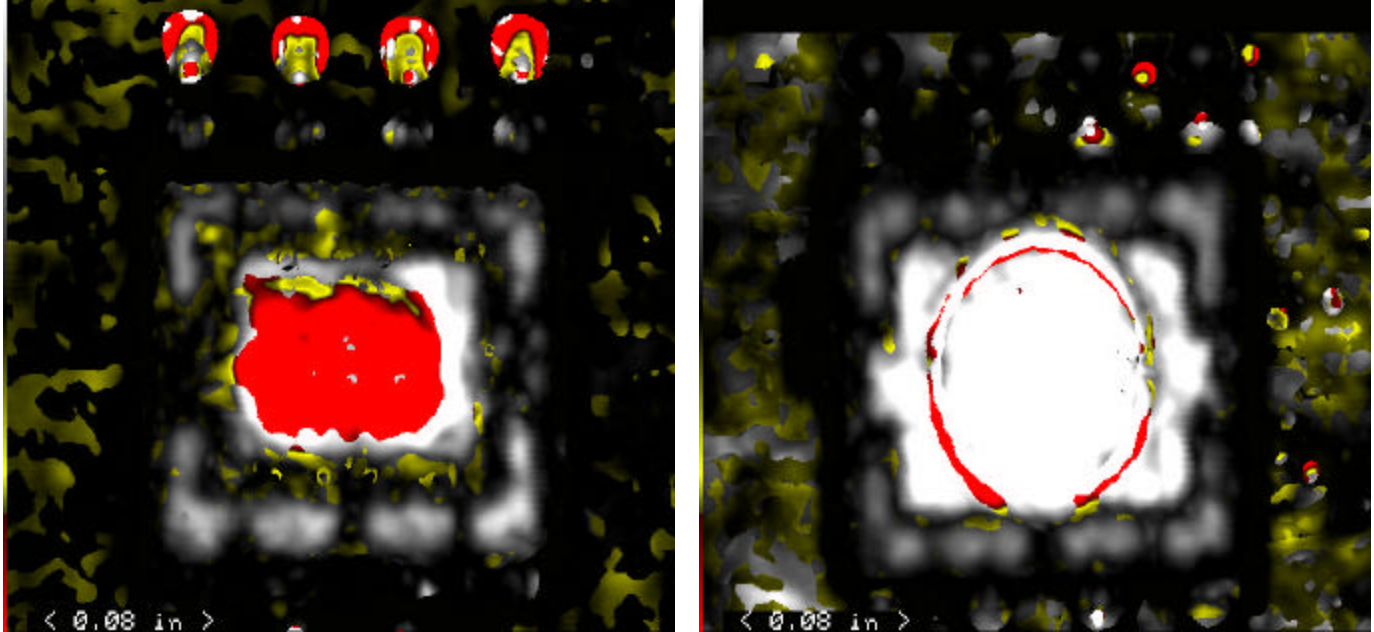
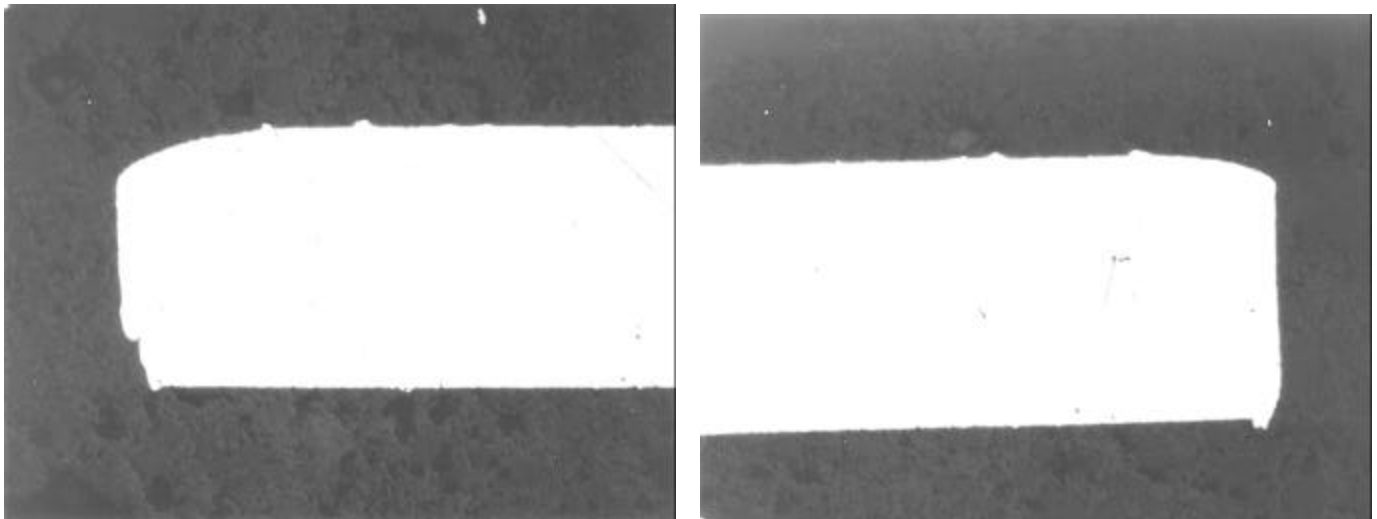


Figure 7. Top (left) and bottom C-SAM images of SN H07.

Figure 8. Cross-section images of SN G05 showing portions of the die paddle embedded in the plastic molding material. Both images  $\approx 200\times$ .

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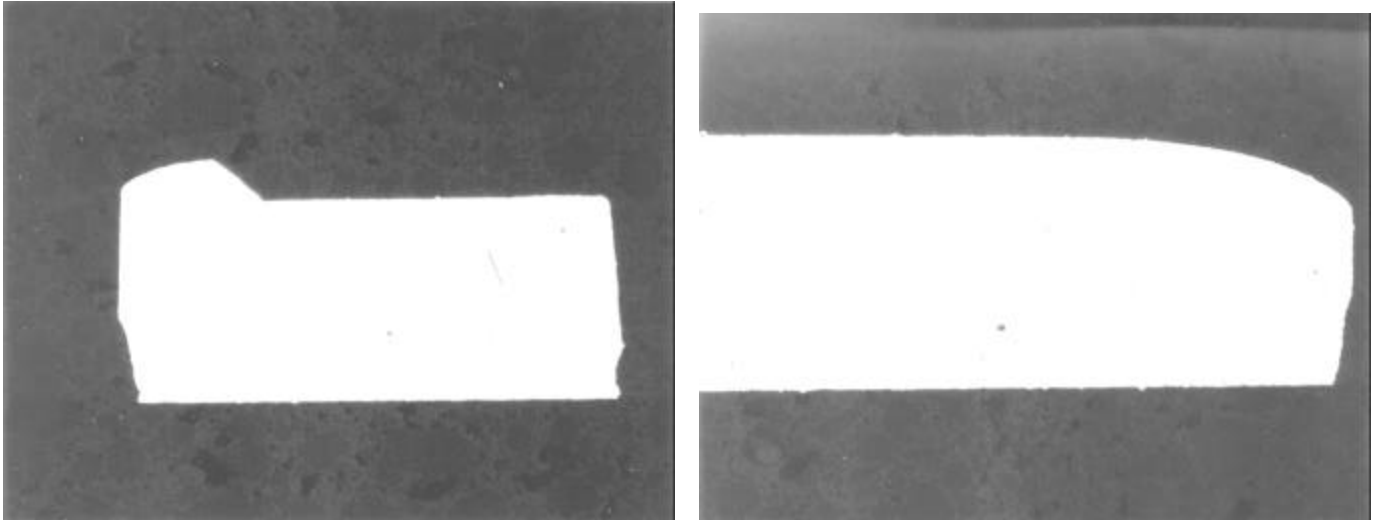


Figure 9. Cross-section images of SN G07. Left images shows lead frame finger embedded in plastic; right image shows a portion of the die paddle embedded in the plastic. Both images  $\approx 200X$ .

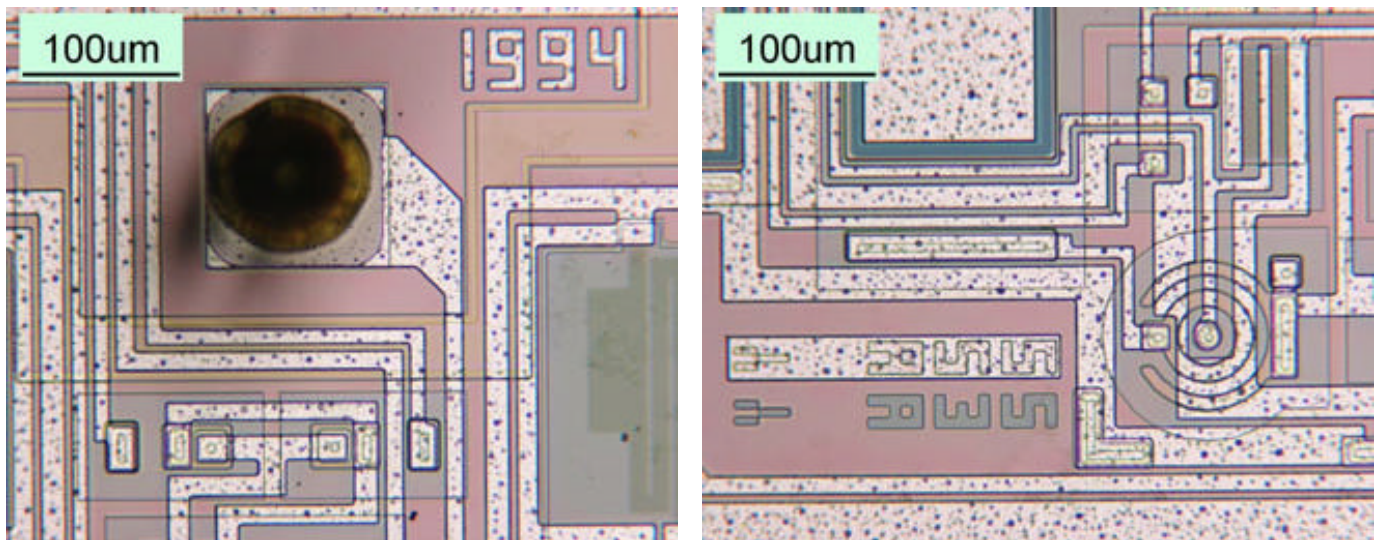


Figure 10. Optical micrograph images of SN H01 die show general device features.



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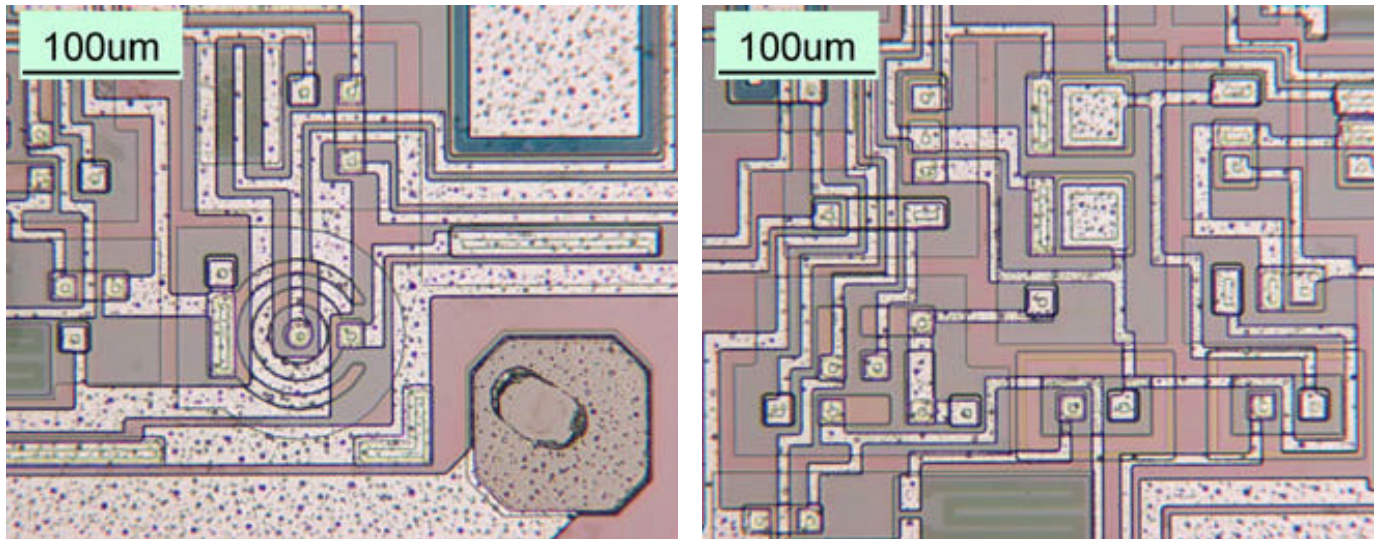


Figure 11. Optical micrograph images of SN H05 die.

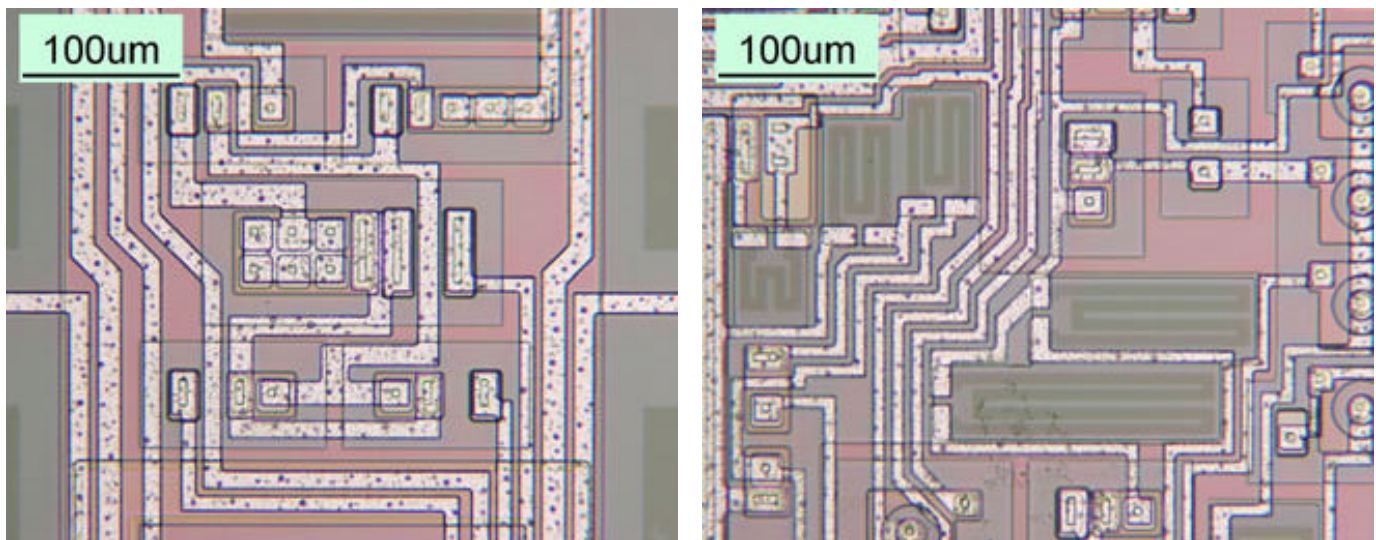


Figure 12. Optical micrograph images of SN H07 die.



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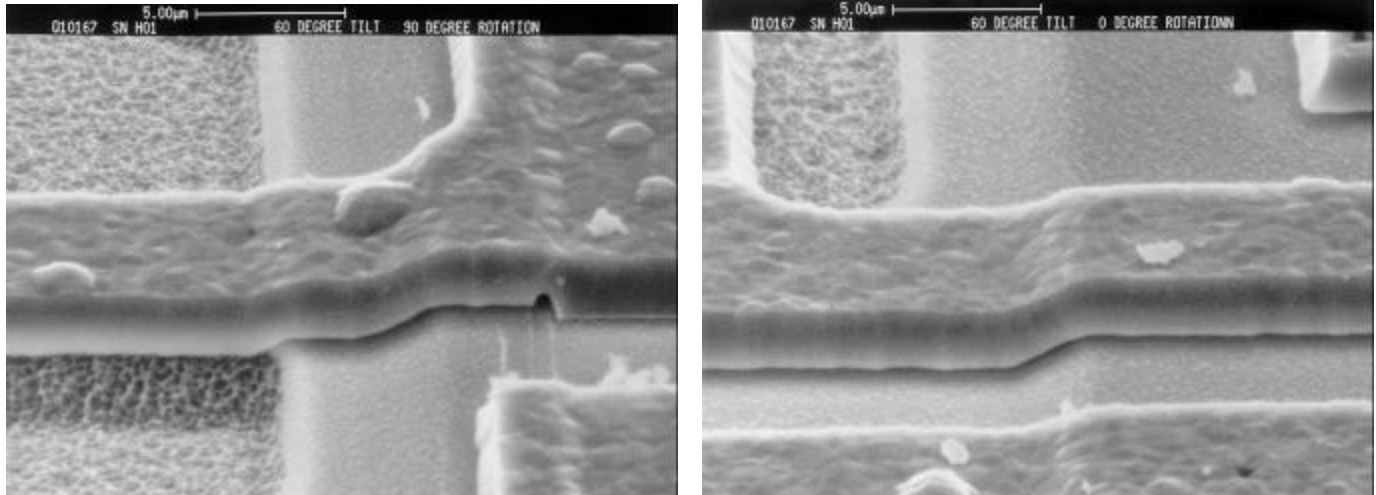


Figure 13. SEM micrograph shows excellent step coverage metallization on SN H01.

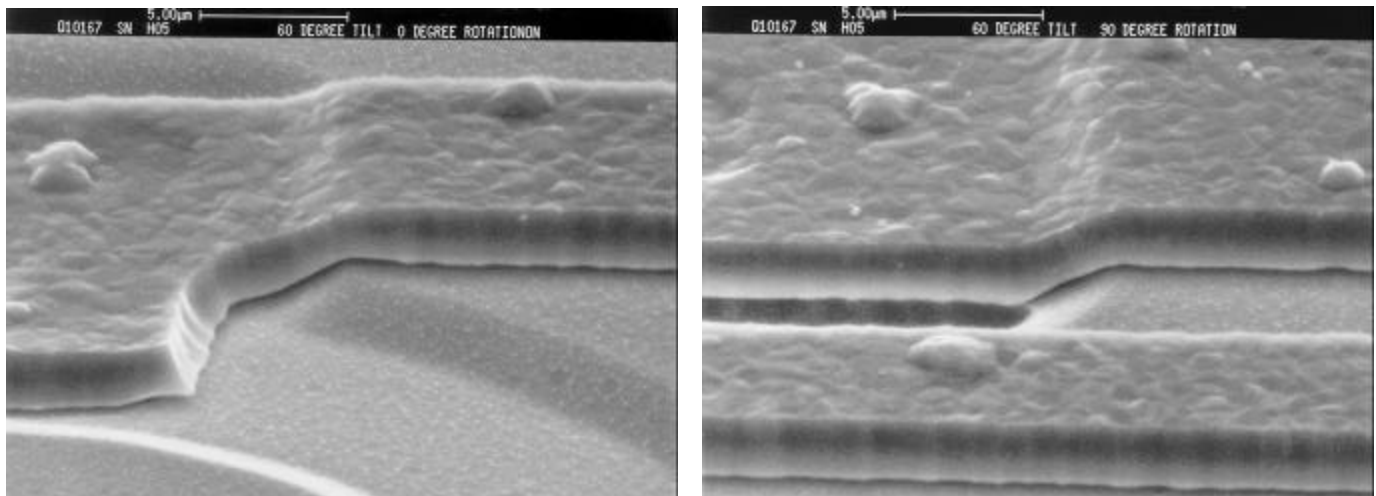


Figure 14. SEM micrographs of SN H05 show excellent step coverage.

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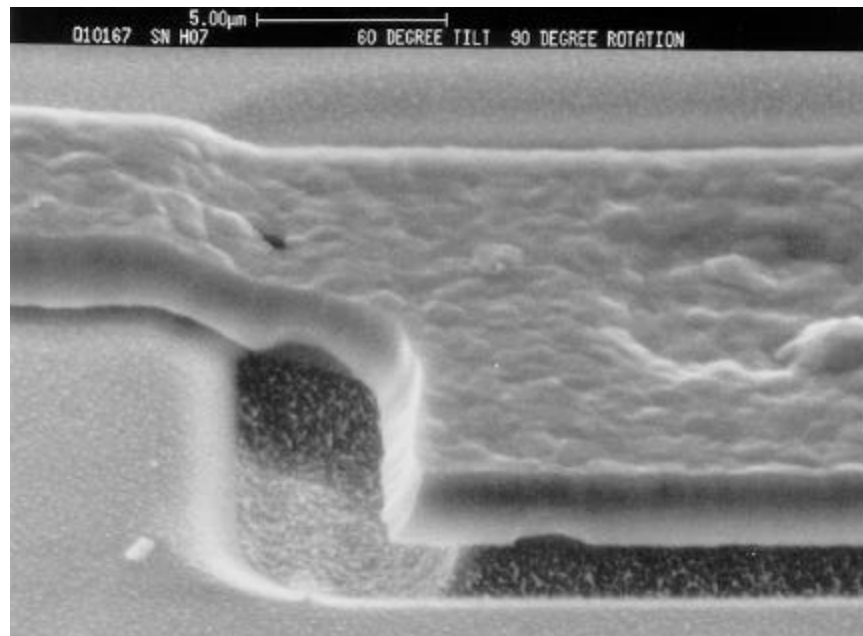


Figure 15. SEM micrograph of SN H07.

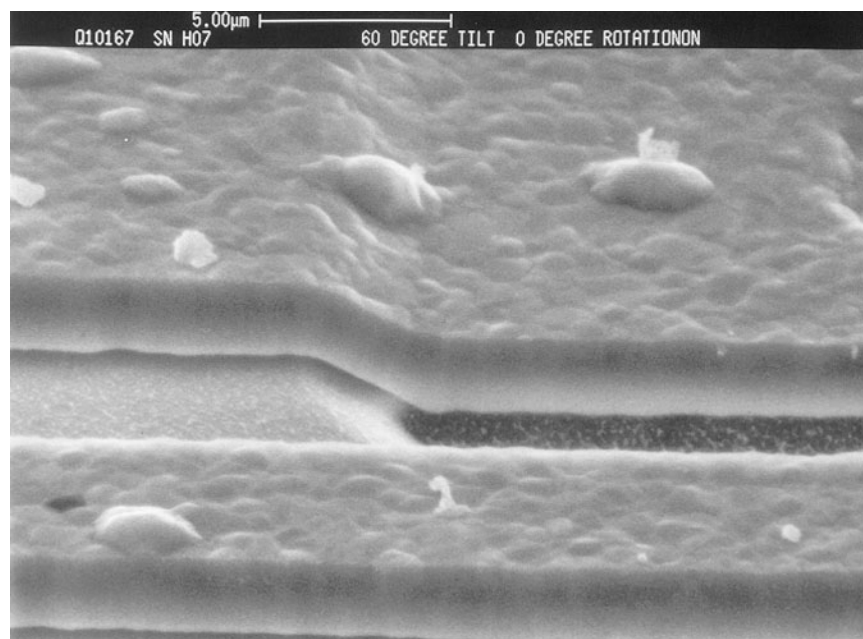


Figure 16. SEM micrograph of SN H07.